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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
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09/000,626 12/30/97 RENGARAJAN,

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EXAMINER

TRAN, T

ART UNIT

PAPER NUMBER

2811

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SIEMENS
INTELLECTUAL PROPERTY DEPARTMENT
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Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks

Office Action Summary

Application No.
09/000,626

Applicant(s)
Rengarajan et al.

Examiner
Thien Tran

Group Art Unit
2811



☐ Responsive to communication(s) filed on _____

☐ This action is **FINAL**.

☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11; 453 O.G. 213.

A shortened statutory period for response to this action is set to expire 3 month(s), or thirty days, whichever is longer, from the mailing date of this communication. Failure to respond within the period for response will cause the application to become abandoned. (35 U.S.C. § 133). Extensions of time may be obtained under the provisions of 37 CFR 1.136(a).

Disposition of Claims

☒ Claim(s) 1-5, 7, 8, 10, and 12-25 is/are pending in the application.

Of the above, claim(s) 12-23 is/are withdrawn from consideration.

☐ Claim(s) _____ is/are allowed.

☒ Claim(s) 1-5, 7, 8, 10, 24, and 25 is/are rejected.

☐ Claim(s) _____ is/are objected to.

☐ Claims _____ are subject to restriction or election requirement.

Application Papers

☐ See the attached Notice of Draftsperson's Patent Drawing Review, PTO-948.

☐ The drawing(s) filed on _____ is/are objected to by the Examiner.

☐ The proposed drawing correction, filed on _____ is ☐ approved ☐ disapproved.

☐ The specification is objected to by the Examiner.

☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. § 119

☐ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d).

☐ All ☐ Some* ☐ None of the CERTIFIED copies of the priority documents have been

☐ received.

☐ received in Application No. (Series Code/Serial Number) _____

☐ received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

*Certified copies not received: _____

☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

Attachment(s)

☒ Notice of References Cited, PTO-892

☒ Information Disclosure Statement(s), PTO-1449, Paper No(s). 12

☐ Interview Summary, PTO-413

☐ Notice of Draftsperson's Patent Drawing Review, PTO-948

☐ Notice of Informal Patent Application, PTO-152

--- SEE OFFICE ACTION ON THE FOLLOWING PAGES ---

Art Unit: 2811

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1-5, 7, 8, 10, 24 and 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fukuda (JP 57-159038 of record) in view of Lou et al. (US 5,872,045) and Wolf (reference U of record).

Fukuda discloses a trench isolation structure (Figs. 4a-4e) comprising a V-shaped trench in a substrate 10; a nitride liner 12' recessed within the trench and the nitride liner forming a partially enclosed volume; an oxide layer 11' formed within the trench, the oxide layer underlying the nitride liner 12'; a polysilicon 5 to fill in the trench; and an oxide layer 11 on the top surface of the substrate. Fukuda does not disclose using a dielectric material of oxide to fill the trench. However, both polysilicon and oxide are materials known in the art and routinely used to fill trench isolation structure. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to select any one of these materials as a suitable trench fill in Fukuda's device, since it has been held to be within the general skill of a worker in the art to

Art Unit: 2811

select a known material on the basis of its suitability for the intended use as a matter of design choice. In re Leshin, 125 USPQ 416. In fact, Lou et al. discloses the formation of trench isolation structure with an oxide or polysilicon filling the trench (col. 1, lines 35-60).

Fukuda does not explicitly disclose the uppermost surface of the nitride liner 12' is disposed below a transistor channel depth of a transistor beside the trench isolation structure. First, it is old and well known in the art that shallow trench isolation structures are formed in the substrate to isolate and define an active region that includes a transistor, source/drain regions and a channel region. Therefore, the incorporation of a transistor in an active region beside the trench isolation structure is prima facie obvious. Second, Wolf discloses a shallow trench isolation structure formed in the substrate (5000-8000 angstroms deep) (page 45, line 28) is much deeper than source and drain junction depths (smaller than 2500 angstroms) (page 154, line 6). Trench isolation structures are routinely formed much deeper than the source/drain regions or channel region for obvious reasons. A nitride liner is formed on the bottom of the trench as taught by Fukuda. Therefore, it is obvious Fukuda's device provides a nitride liner below the transistor channel depth.

Regarding claim 2, Fukuda does not specifically disclose a P-FET transistor. It is old and well known in the art to form trench isolation structure in the support circuitry with P-FET transistors generally employed.

Regarding claim 3, Fukuda does not explicitly disclose a nitride liner wherein the uppermost surface is disposed greater than 1000 angstroms below a top surface of the substrate.

Art Unit: 2811

It would be an obvious matter of design choice to select the depth of the uppermost surface of the nitride liner since it is depended on the trench's depth. The trench's depth may vary with specific designs. Trench's depth in semiconductor devices is an art recognized variable of importance which is subject to routine experimentation and optimization. Accordingly, it would be well for one within ordinary skill in the art to select the depth of the uppermost surface of the nitride liner as taught by Fukuda in association with the trench's depth selection. Also, the application contains no disclosure of either the critical nature of the claimed dimension or any unexpected results arising therefrom. In *re Daily*, 93 USPQ 47 (CCPA 1966), the court held that changes in size and shape of parts of an invention in the absence of an unexpected result involves routine skill in the art. Additionally, In *Gardner v. TEC Systems, Inc.*, 725 F.2d 1338, 220 USPQ 777 (Fed. Cir. 1984), cert. denied, 469 U.S. 830, 225 USPQ 232 (1984), the Federal Circuit held that where the only difference between the prior art and the claims was a recitation of relative dimensions of the claimed device and a device having the claimed relative dimensions would not perform differently than the prior art device, the claimed device was not patentably distinct from the prior art device. Furthermore, the application provides no indication that this particular chosen dimension is unconventional. Where patentability is said to be based upon particular chosen dimensions or upon another variable recited in a claim, the Applicant must show that the chosen dimension is critical. In *re Woodruff*, 919 F.2d 1575, 1578, 16 USPQ 2d 1934, 1936 (Fed. Cir. 1990).

Art Unit: 2811

Regarding claims 7 and 25, it is conventional to fill the trench isolation with an oxide fill of TEOS. Therefore, the incorporation of an oxide fill of TEOS into the Fukada's device is prima facie obvious.

The claim limitations "said nitride liner may trap substantially no charge traversing said channel of said P-FET transistor" in claim 10, "prevents charge trapping in the shallow trench isolation structure due to the channel" and "such that polysilicon material used in other processing is prevented from entering the trench" in claim 24 are functional languages and are given no patentable weight since it has been held that claims directed to apparatus must be distinguished from the prior art in terms of structure rather than function. *In re Danley*, 120 USPQ 528, 531 (CCPA 1959). "Apparatus claims cover what a device is, not what a device does." *Hewlett-Packard Co. v. Bausch & Lomb Inc.*, 15 USPQ2d 1525, 1528 (Fed. Cir. 1990). A claim containing a "recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus" if the prior art apparatus teaches all the structural limitations of the claim. *Ex parte Masham*, 2 USPQ2d 1647 (Bd. Pat. App. & Inter. 1987). Furthermore, Fukuda has the claimed structure so it would have been obvious that the claimed properties are inherently present in Fukuda's device.

The claim limitation "for preventing hot carrier effects due to charge trapping" in the claim preamble of claim 24 specifies an intended use or field of use is treated as nonlimiting since it has been held that in device claims, intended use must result in a structural difference between the claim invention and the prior art in order to patentably distinguish the claim invention from the

Art Unit: 2811

prior art. If the prior art structure is capable of performing the intended use, then it meets the claim. *In re Casey*, 152 USPQ 235 (CCPA 1967); *In re Otto*, 136 USPQ 458, 459 (CCPA 1963). Also, a claim containing a "recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus" if the prior art apparatus teaches all the structural limitations of the claim. *Ex parte Masham*, 2 USPQ2d 1647 (Bd. Pat. App. & Inter. 1987).

Response to Arguments

3. Applicant's arguments filed 08/02/1999 have been fully considered but they are not persuasive.

In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

The examiner further disagrees with applicant's remark that Fukuda's device is not an isolation region and the polysilicon of Fukuda may be a metal line or other conductive component. Applicant's argument cannot replace evidence where evidence is necessary. *In re Schulze*, 346 F.2d 600, 602, 145 USPQ 716, 718 (CCPA 1965); *In re Geisler*, 116 F.3d 1465, 43 USPQ2d 1362 (Fed. Cir. 1997). Here, it is evident that the prior art discloses a V-shaped isolation region as the title, drawing and specification clearly indicated. Furthermore, it is well known that

Art Unit: 2811

polysilicon is routinely used to fill and form trench isolation region (see Lou et al., Poon et al. and Beasom references).

Conclusion

4. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. References B-D are being cited since these show a trench isolation structure comprising a polysilicon fill.

5. **Papers related to this application may be submitted to Technology center (TC) 2800 by facsimile transmission. Papers should be faxed to TC 2800 via the TC 2800 Fax center located in Crystal Plaza 4, room 4-C23. The faxing of such papers must conform with the notice published in the Official Gazette, 1096 OG 30 (November 15, 1989). The Group 2811 Fax Center number is (703) 308-7722 and 308-7724. The Group 2811 Fax Center is to be used only for papers related to Group 2811 applications.**

Any inquiry concerning this communication or any earlier communication from the Examiner should be directed to *Thien Tran* whose telephone number is **(703) 308-4108**. The Examiner is in the Office generally between the hours of 8:00AM to 4:30PM (Eastern Standard Time) Monday through Friday.

Any inquiry of a general nature or relating to the status of this application should be directed to the **Technology Center Receptionists** whose telephone number is **308-0956**.

Application/Control Number: 09/000626

Page 8

Art Unit: 2811

Tom Thomas

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October 8, 1999